(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
14 December 2000 (14.12.2000)

PCT

(10) International Publication Number
WO 00/75639 A1

(51) International Patent Classification[7]: G01N 21/33, G01J 1/04

(21) International Application Number: PCT/US00/15818

(22) International Filing Date: 8 June 2000 (08.06.2000)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
09/328,811 9 June 1999 (09.06.1999) US

(71) Applicant: JOBIN YVON INC. [US/US]; 3880 Park Avenue, Edison, NJ 08820 (US).

(72) Inventor: VEZARD, Nicolas; 219 Highland Avenue, Metuchen, NJ 08840 (US).

(74) Agents: AHN, Harry, K. et al.; Baker & McKenzie, 805 Third Avenue, New York, NY 10022 (US).

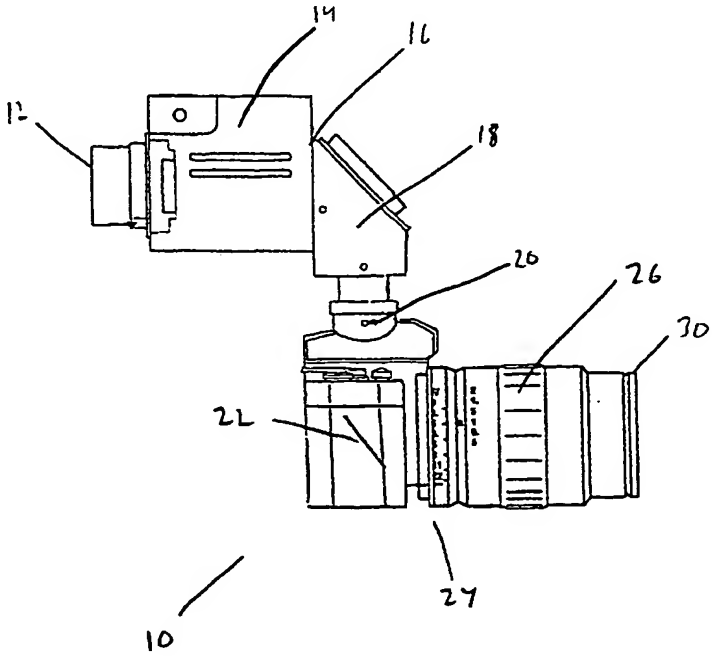
(81) Designated States *(national)*: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:
— *With international search report.*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: UV-IMAGER SYSTEM



(57) Abstract: A UV-Imager system (10) includes a camera (24). The camera (24) includes a first UV-reflective mirror (22) and a quartz UV-transmissive camera lens (26). The UV-Imager system (10) also includes a second UV-reflective mirror (18) coupled to the camera (24), and an intensifier (14) coupled to the second UV-reflective mirror (18).

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UV-IMAGER SYSTEM

FIELD OF THE INVENTION

The present invention is directed to the detection of fingerprints and other forensic evidence. More particularly, the present invention is directed to a UV-Imager system that photographs and provides simultaneous viewing of fingerprints and other evidence.

BACKGROUND OF THE INVENTION

Special tools are frequently used by law enforcement personnel when evaluating a crime scene to collect forensic evidence that is naked to the human eye. Examples of such is evidence include the detection of bodily fluids, fingerprints on porous and no-porous surfaces, forged documents, explosive residue, and trace evidence (e.g., hair, fibers, etc.) one commonly used tool is a Forensic Light Source. A Forensic Light Source utilizes fluorescent light to detect and record forensic evidence.

A recently introduced complimentary tool to the Forensic Light Source is a tool that relies on intensified short-wave ultraviolet ("UV") reflectance instead of fluorescence. A UV tool can reveal additional evidence on non-porous surfaces where a Forensic Light Source is not useable or requires processing with powders or fluorescent dyes to be useable.

In conventional forensic tools that utilize UV reflectance, a traditional photograph is taken of the output of an intensifier tube. However, photographing the output of an intensifier is limited by the number of line pairs/mm specification of each intensifier. The intensifier is necessary to obtain the focus in invisible light such as UV (200-400nm) or infrared (above 700nm).

One UV tool that does not rely on the output of an intensifier to obtain a photograph is a "SceneScope" UV-Imager is system with a modified FM2 camera from Instruments S.A., Inc. The prior art Scenescope utilizes an intensifier and a modified 35mm camera to provide both non-intensified photography of reflectance of fingerprints on various backgrounds, and simultaneous intensified image focusing and viewing. However, one problem with the prior art SceneScope is that the image quality is degraded because a relatively low percentage of UV light is reflected by the 35mm camera.

Based on the foregoing, there is a need for an improved UV-Imager system.

SUMMARY OF THE INVENTION

One embodiment of the present invention is a UV-Imager system that includes a camera. The camera includes a first UV coated mirror and a quartz UV transmittive camera lens. The UV-Imager system also includes a second UV coated mirror coupled to the camera through a lens system, and an intensifier coupled to the second UV coated mirror.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a side view of a UV-Imager system in accordance with one embodiment of the present invention.

DETAILED DESCRIPTION

One embodiment of the present invention is a UV-Imager system that includes UV coated mirrors to increase the amount of internally reflected UV light.

Fig. 1 is a side view of a UV-Imager system 10 in accordance with one embodiment of the present invention. UV-Imager system 10 includes a camera 24. Camera 24 can be a modification of a conventional camera. In one embodiment, camera 24 is a modified FM2 camera from Nikon Corp.

The conventional camera is modified by removing the mirror included with the camera and replacing it with a UV coated mirror 22. The UV coating of UV coated mirror 24 is within the range of approximately 200-360 mm. In one embodiment, the UV coating of 10 UV coated mirror 24 is approximately 254 nm, and reflects 90-95% of UV light compared to a 20-25% reflection for a conventional mirror.

Camera 24 further includes a dual lens system (not shown) that replaces the prism found in a conventional camera. In one embodiment, the dual lens system includes two lenses, each of which is a silica lens with f=50mm and diameter=22.5mm. In addition, camera 24 does not have a focusing screen that is included in conventional cameras.

Camera 24 is loaded with a UV sensitive film. In one embodiment, the film is Kodak Tri-X 400 ASA.

Camera 24 includes a UV transmittive camera lens 26. Camera lens 26 can be any known manual or motorized lens or zoom lens that is made of UV transmittive material. In one embodiment, camera lens 26 is a modified 105mm Nikon quartz lens. Coupled to lens 26 is a 254 nm filter 30. In another embodiment, two stacked 254 nm filters 30 are coupled to lens 26. This embodiment is more suitable for outdoor use.

Camera 24 is coupled to a second mirror holder 18 by a lockable mechanism 20. Lockable mechanism 20 allows second mirror holder 18 to be adjusted relative to camera 24. Second mirror holder 18 includes a UV coated mirror (not shown) having UV coating within the range of approximately 200-360 nm.

Second mirror holder 18 is coupled to an intensifier 14 through a flush contact 16. Intensifier 14 intensifies light is received from second mirror holder 18 so that the light can

be directly viewed or sent to a charge-coupled device ("CCD"). Intensifier 14 can be a first, second, or third generation intensifier, or merely a UV to green light converter.

An eyepiece 12 is coupled to intensifier 14. Eyepiece 12 can be used for direct eye viewing. Further, a CCD or a video camera can be coupled to eyepiece 12 to provide video monitor viewing/focusing or videotaping while the objects are photographed on the UV film.

In combination, UV-Imager system 10 allows fingerprints or other forensic objects to be photographed by camera 24, or simultaneously viewed through eyepiece 12. The UV coating on the mirrors of system 10 boost the UV reflectance which enhances the image of the objects. The removal of the focusing screen and the prism in camera 24 increases the LTV transmission towards intensifier 14. The dual lens system between mirror 24 and second mirror holder 18 re-images the objects as a flat field onto the front face of intensifier 14.

Several embodiments of the present invention are specifically illustrated and/or described herein. However, it will be appreciated that modifications and variations of the present invention are covered by the above teachings and within the purview of the appended claims without departing from the spirit and intended scope of the invention.

For example, in the embodiment shown in Fig. 1, the intensifier is separate from the camera. However, provided the camera body is large enough, the intensifier can be installed inside the camera body. This can reduce the number of optics and increase the image quality on the output of the intensifier.

WHAT IS CLAIMED IS:

1. A UV-Imager system comprising:

a camera comprising a first UV coated mirror and a UV transmittive camera lens;

a second UV coated mirror coupled to said camera; and

an intensifier coupled to said second UV coated mirror.

2. The UV-Imager system of claim 1, said camera further comprising a dual lens system.

3. The UV-Imager system of claim 1, further comprising:

a mirror holder housing said second mirror; and

a lockable mechanism coupling said mirror holder to said camera.

4. The UV-Imager system of claim 1, wherein said first and second UV coated mirrors have a UV coating within the range of approximately 200-360 nm.

5. The UV-Imager system of claim 4, wherein said UV coating is approximately 254 nm.

6. The UV-Imager system of claim 1, further comprising an eyepiece coupled to said intensifier.

7. The UV-Imager system of claim 6, further comprising a charge-coupled device coupled to said eyepiece.

8. The UV-Imager system of claim 6, further comprising a video camera coupled to said eyepiece.

9. The UV-Imager system of claim 11, said intensifier being selected from a group consisting of a first generation intensifier, a second generation intensifier, and a third generation intensifier.

10. The UV-Imager system of claim 1, said intensifier comprising a UV to green light converter.

11. The UV-Imager system of claim 1, said camera further comprising a camera body;

Wherein said intensifier is mounted within said camera body.

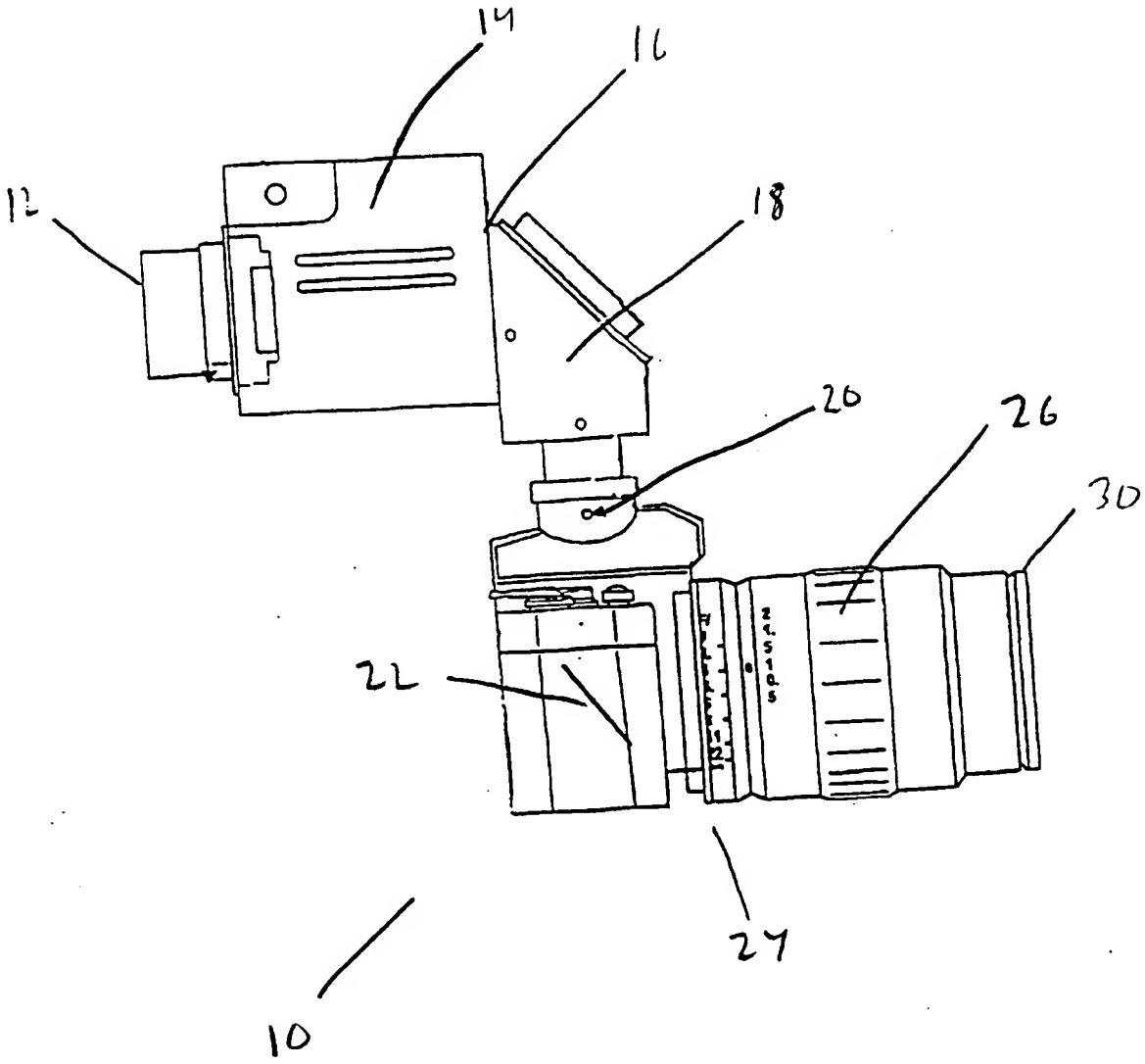

Fig. 1

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/15818

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : G01N 21/33; G01J 1/04
US CL : 250/372; 359/351, 353, 355

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
U.S. : 250/372; 359/351, 353, 355

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
USPTO APS EAST search terms: UV, ultraviolet, camera, imaging, intensifier, mirror, lens

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4,047,206 A (KITAGAMI et al.) 06 September 1977, (06.09.1977), col. 1, lines 5-23; col. 2, lines 3-13; col. 4, lines 17-36; Figs. 1-4.	1-11
Y	US 5,149,972 A (Fay et al.) 22 September 1992 (22.09.1992), col. 4, lines 49-68; col. 9, lines 40-50; Fig. 1.	1-11
Y, P	US 5,932,886 A (ARAI et al.) 03 August 1999 (03.08.1999), col. 5, lines 7-10 and 48-55; Figs1,2.	4-5
A,P	US 6,009,340 A (HSIA) 28 December 1999 (28.12.1999), entire document.	1-11
A	US 5,581,356 A (VEZARD) 3 December 1996 (03.12.1996), entire document.	1-11
A	US 5,485,530 A (LAKOWICZ et al.) 16 January, 1996 (16.01.1996), entire document.	1-11
A	US 5,481,401 A (KITA et al.) 02 January 1996 (02.01.1996), entire document.	1-11

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
28 August 2000 (28.08.2000)	19 SEP 2000
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703)305-3230	Authorized officer Seungsook Ham Marcelo Telephone No. (703) 308-0956

Form PCT/ISA/210 (second sheet) (July 1998)